THE PRESOCRATIC PHILOSOPHERS

Second Edition

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The Presocratic Philosophers

A CRITICAL HISTORY WITH A SELECTION OF TEXTS

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Second Edition

CAMBRIDGE
UNIVERSITY PRESS

Telif hakkı olan materyal

PUBLISHED BY THE PRESS SYNDICATE OF THE UNIVERSITY OF CAMBRIDGE
The Pitt Building, Trumpington Street, Cambridge, United Kingdom

CAMBRIDGE UNIVERSITY PRESS
The Edinburgh Building, Cambridge CB2 2RU, UK
40 West 20th Street, New York, NY 10011–4211, USA
477 Williamstown Road, Port Melbourne, VIC 3207, Australia
Ruiz de Alarcón 13, 28014 Madrid, Spain
Dock House, The Waterfront, Cape Town 8001, South Africa

http://www.cambridge.org

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First published 1957
Reprinted with corrections 1960, 1962, 1963
Reprinted 1964, 1966, 1969, 1971, 1973, 1975, 1976, 1977, 1979
Second edition 1983
Reprinted 1984, 1985, 1987, 1988, 1990, 1991, 1993,
1995 (with additional bibliographical items), 1999, 2002, 2003

Printed in the United Kingdom at the University Press, Cambridge

Library of Congress catalogue card number: 82-23505

British Library Cataloguing in Publication data
Kirk, G. S.
The presocratic philosophers.—2nd ed
1. Philosophy, Ancient
I. Title II. Raven, J. E. III. Schofield, M.
180'938 B171

ISBN 0 521 27455 9 paperback

(First edition ISBNS
ISBN 0 521 05891 0 hardback
ISBN 0 521 09169 1 paperback)

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PREFACE TO SECOND EDITION

It is now more than twenty-five years since *The Presocratic Philosophers* first appeared; it has been through many printings since, with minor corrections until 1963 and subsequently without change. During the last few years GSK and JER were conscious that a basically revised edition would soon be needed, if it was not overdue. JER's health was not good and his research interests had become exclusively botanical; he therefore asked GSK to gauge the moment and suggest a third member of the team. As it happened, the part of the book that was primarily JER's called for most revision because of the way scholarly interests had developed; but GSK, too, had been working in other fields and needed a collaborator in the thick of things. MS agreed in 1979 to become a partner in the enterprise, and there was complete accord between all three on how the work should be done.

There are major and important changes in this new edition. MS has completely rewritten the chapters on the Eleatics and Pythagoreans, principally because of work by analytic philosophers on the former and by Walter Burkert (in particular) on the latter – work which has called for some reassessment of the Cornford–Raven view on the interrelations between the two schools. Alcmaeon has been incorporated in these chapters. MS has likewise completely rewritten the chapter on Empedocles to take account of the reinterpretations of J. Bollack, G. Zuntz and others and the controversy these have provoked. It is hoped that the arrangement of the fragments of Empedocles in their probably original order will be found more useful by the reader. The chapter on Anaxagoras, on the other hand, remains largely as JER wrote it; MS has indicated in footnotes how his own solutions (for which see his *An Essay on Anaxagoras*, Cambridge, 1980) might differ here and there, but it was the wish of all three authors that this chapter should remain largely unchanged. Archelaus, too, remains unaltered, and Diogenes is expanded by a single footnote; on the Atomists MS has rewritten the sections on metaphysical principles, on atoms and the void and on the weight of atoms (to take account of the work of D. J. Furley, J. Barnes, D. O' Brien

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and others), also on epistemology and ethics – the ethics section being largely the work of Dr J. F. Procopé, to whom we express warm thanks.

The earlier part of the book has been revised throughout by GSK, but with little complete rewriting. Chapter 1, on Forerunners, has been rearranged, abbreviated and simplified in places, and has additional sections on the new Orphic material, on the Alcman cosmogonical fragment and on the movement from myths to philosophy. There has been a spate of publication on the Milesians, Xenophanes and Heraclitus over the last quarter-century, but the effects have been minor compared with those of work on the Pythagoreans and Eleatics and on Empedocles. Account has been taken of the contributions of, in particular, C. H. Kahn (on Anaximander and Heraclitus), J. Barnes and W. K. C. Guthrie, but the interpretation and presentation, despite numerous changes in detail, have not been very drastically altered. That reflects a general conviction that the book should not be radically changed in its approach and emphasis, except where necessary; and also the opinion of GSK, at least, that despite all the dust of battle the real advances, with respect to these earlier thinkers, have been quite small.

A definite improvement, especially for the many readers who use the translations rather than the Greek texts, has been to bring these up into the body of the text. The Bibliography has been brought up to date, and the new Index Locorum is the work of Mr N. O'Sullivan, to whom the authors are most grateful, as they also are to the publishers and printers for their help and their careful treatment of a relatively complicated text. But 'the authors' means, sadly, the surviving ones, for JER died in March 1980, aged 65; his remarkable gifts and lovable personality are well conveyed in *John Raven by his Friends* (published in 1981 by his widow, Faith Raven, from Docwra's Manor, Shepreth, Herts., England). On a happier note it is a pleasure to re-dedicate the book to Professor F. H. Sandbach, whose profound learning is even better appreciated now than it was then.

G.S.K.

June 1983 M.S.

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PREFACE TO FIRST EDITION

This book is designed primarily for those who have more than a casual interest in the history of early Greek thought; but by translating all Greek passages, and confining some of the more detailed discussion to small-type notes at the end of paragraphs, we have also aimed to make the book useful for those students of the history of philosophy or science who have no previous acquaintance with this important and fascinating field.

Two points should be emphasized. First, we have limited our scope to the chief Presocratic 'physicists' and their forerunners, whose main preoccupation was with the nature (*physis*) and coherence of things as a whole. More specialized scientific interests were simultaneously developing throughout the sixth and fifth centuries B.C., especially in mathematics, astronomy, geography, medicine and biology; but for lack of space, and to some extent of evidence, we have not pursued these topics beyond the interests of the chief physicists. We have also excluded the Sophists, whose positive philosophical contribution, often exaggerated, lay mainly in the fields of epistemology and semantics. Secondly, we have not set out to produce a necessarily orthodox exposition (if, indeed, such a thing is conceivable in a field where opinion is changing so rapidly), but have preferred in many places to put forward our own interpretations. At the same time we have usually mentioned other interpretations of disputed points, and have always tried to present the reader with the main materials for the formation of his own judgement.

The part of the book dealing with the Ionian tradition, including its forerunners and also the atomists and Diogenes (i.e. chapters I–VI, XVII and XVIII), with the note on the sources, is by G. S. Kirk, while the part dealing with the Italian tradition, and also the chapters on Anaxagoras and Archelaus (i.e. chapters VII–XVI), are by J. E. Raven. The contributions of each author were of course subjected to detailed criticism by the other, and the planning of the book as a whole is by both.

The scale of different sections of the book is admittedly rather

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variable. Where the evidence is fuller and clearer – particularly where considerable fragments survive, as for example in the case of Parmenides – the commentary can naturally be shorter; where the evidence is sparser and more confusing, as for example in the case of Anaximander or the Pythagoreans, our own explanations must be longer and more involved. Chapter 1 in particular, which deals with a part of the subject which is often neglected, is perhaps more detailed in parts than its ultimate importance demands, and non-specialists are advised to leave it until last.

Only the most important texts have been quoted, and those in an inevitably personal selection. For a nearly complete collection of fragments and testimonies the reader should turn to H. Diels, *Die Fragmente der Vorsokratiker* (5th and later editions, Berlin, 1934–54, edited by W. Kranz). This fundamental work is referred to by the abbreviation DK. Where a DK number (e.g. DK 28 A 12) is appended to the reference of a passage quoted in the present work, this means that DK, in the section referred to, quotes more of the passage in question than we do. DK references are omitted where less, or no more, of the text is given, and also in the case of fragments (where the fragment-number, always in Diels' numeration, is the same as the number in the relevant B-section in DK). Where supplements occur in texts quoted, without further information, they are usually by Diels, and reference may be made to the textual notes in DK.

We are obviously indebted to many friends for suggestions and help; and also, as goes without saying, to previous writers like Zeller, Burnet, Cornford, Ross and Cherniss. Many of these debts are recorded in the text. For typographical advice and assistance we are indebted to the printing staff of the Cambridge University Press. H. Lloyd-Jones and I. R. D. Mathewson read the proofs and made many valuable suggestions. Another outstanding contribution was made by F. H. Sandbach, whose numerous acute and learned comments on the final draft were of the utmost value, and to whom, as an unworthy offering, we should like to dedicate this book.

G.S.K.
J.E.R.

Cambridge
May 1957

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THE IONIAN THINKERS

It was in Ionia that the first really rational attempts to describe the nature of the world took place. There, material prosperity and special opportunities for contact with other cultures – with Sardis, for example, by land, and with the Pontus and Egypt by sea – were allied, for a time at least, with a strong cultural and literary tradition dating from the age of Homer. Within the space of a century Miletus produced Thales, Anaximander, and Anaximenes, each dominated by the assumption of a single primary material, the isolation of which was the most important step in any systematic account of reality. This attitude was clearly a development of the genetic or genealogical approach to nature exemplified by the Hesiodic *Theogony* and described in chapter I. After the great Milesians, however, the attitude was moderated or abandoned. Xenophanes is here treated among the Ionians (chapter V), but in fact he does not fit into any general category. Born and brought up in Colophon, and strongly aware of Ionian ideas (more so, apparently, than Pythagoras), he moved to western Greece and was only incidentally interested in the details of cosmogony and cosmology. In Ephesus, meanwhile, the individualistic Heraclitus outstepped the limits of material monism, and, while retaining the idea of a basic (though not a cosmogonic) substance, discovered the most significant unity of things in their structure or arrangement. Here there is a parallel with Pythagorean theories in the west of the Greek world. Pythagoras and (a little after him) Parmenides were influential thinkers, and for a time the western schools were all-important; but the Ionian materialistic monism reasserted itself, to a certain extent, in the compromises of some of the post-Parmenidean systems.

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CHAPTER II

Thales of Miletus

DATE

Traditionally the earliest Greek physicist, or enquirer into the nature of things as a whole (**85**), Thales predicted an eclipse which took place in 585 B.C. (**74**). He was presumably not active, therefore, much earlier than the beginning of the sixth century.[1]

[1] The eclipse took place in Ol. 48, 4 (585/4) according to Pliny, *N.H.* II, 53 (DK 11 A 5), who presumably followed Apollodorus; and a year or more later according to the Eusebian scheme (DK 11 A 5). Modern calculations put it on 28 May 585 B.C., i.e. in Ol. 48, 3. Tannery's view that the eclipse predicted by Thales was that of 610 is now rejected. Apollodorus according to Diogenes Laertius I, 37–8 (DK 11 A 1) put Thales' birth in Ol. 35, 1 (640), his death in Ol. 58 (548–545) at the age of seventy-eight. There is a fault in the mathematics here: probably Ol. 35, 1 is a mistake, by the common confusion of ξ and δ, for Ol. 39, 1 (624). Apollodorus, then, characteristically placed Thales' death around the epoch-year of the capture of Sardis, his *acme* at the time of the eclipse, and his birth the conventional forty years earlier. This accords approximately with a different and slightly earlier dating authority: Demetrius of Phaleron, according to Diog. L. I, 22 (DK 11 A 1), placed the canonization of the Seven Sages (of whom Thales was a universally accepted member) in the archonship of Damasias at Athens, i.e. 582/1 B.C., the epoch-year of the first restored Pythian festival.

NATIONALITY

62 Diogenes Laertius I, 22 (DK 11 A 1 *init.*) ἦν τοίνυν ὁ Θαλῆς, ὡς μὲν Ἡρόδοτος καὶ Δοῦρις καὶ Δημόκριτός φασι, πατρὸς μὲν Ἐξαμύου μητρὸς δὲ Κλεοβουλίνης, ἐκ τῶν Θηλιδῶν, οἵ εἰσι Φοίνικες, εὐγενέστατοι τῶν ἀπὸ Κάδμου καὶ Ἀγήνορος... ἐπολιτογραφήθη δὲ (*sc.* Ἀγήνωρ) ἐν Μιλήτῳ ὅτε ἦλθε σὺν Νείλεῳ ἐκπεσόντι Φοινίκης. ὡς δ' οἱ πλείους φασίν, ἰθαγενὴς Μιλήσιος ἦν (*sc.* Θαλῆς) καὶ γένους λαμπροῦ.

63 Herodotus I, 170 (from **65**) ...Θαλέω ἀνδρὸς Μιλησίου... τὸ ἀνέκαθεν γένος ἐόντος Φοίνικος...

62 Now Thales, as Herodotus and Douris and Democritus say, was the son of Examyes as father and Cleobuline as mother, from

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the descendants of Theleus, who are Phoenicians, nobles from the line of Cadmus and Agenor...and he [Agenor] was enrolled as a citizen in Miletus when he came with Neileos, when the latter was exiled from Phoenicia. But most people say that Thales was a true Milesian by descent, and of high family.

63 ...of Thales, a man of Miletus...being a Phoenician by ultimate descent...

The story of Thales' Phoenician ancestry, barely mentioned by Herodotus in **63** (though **62** makes it appear as though he had said more; the references in Douris and Democritus are otherwise unknown), was later much elaborated, partly, no doubt, to support the common theory of the eastern origins of Greek science. If Thales drew the attention of the Milesians to the navigational value of the Little Bear, used earlier by Phoenician sailors (see **78**), this would add to the force of Herodotus' comment. The probability is that Thales was as Greek as most Milesians.[1]

[1] Cf. **64** Herodotus I, 146 ...Μινύαι Ὀρχομένιοί σφι (*sc.* the Ionian colonists) ἀναμεμείχαται καὶ Καδμεῖοι καὶ Δρύοπες... (*...Minyans from Orchomenus are mixed with them [the Ionian colonists], and Cadmeians and Dryopes...*). Thus Thales' 'Phoenician' ancestors were probably Cadmeians from Boeotia and not full-blooded Semites. His father, Examyes, seems to have had a Carian name. Herodotus went on to say that even the ostensibly purest Ionian families were mixed by intermarriage with Carian women.

PRACTICAL ACTIVITIES

65 Herodotus I, 170 χρηστὴ δὲ καὶ πρὶν ἢ διαφθαρῆναι Ἰωνίην Θαλέω ἀνδρὸς Μιλησίου ἐγένετο (*sc.* ἡ γνώμη), τὸ ἀνέκαθεν γένος ἐόντος Φοίνικος, ὃς ἐκέλευε ἓν βουλευτήριον Ἴωνας ἐκτῆσθαι, τὸ δὲ εἶναι ἐν Τέῳ (Τέων γὰρ μέσον εἶναι Ἰωνίης), τὰς δὲ ἄλλας πόλιας οἰκεομένας μηδὲν ἧσσον νομίζεσθαι κατά περ εἰ δῆμοι εἶεν.

66 Herodotus I, 75 ὡς δὲ ἀπίκετο ἐπὶ τὸν Ἅλυν ποταμὸν ὁ Κροῖσος, τὸ ἐνθεῦτεν, ὡς μὲν ἐγὼ λέγω, κατὰ τὰς ἐούσας γεφύρας διεβίβασε τὸν στρατόν, ὡς δὲ ὁ πολλὸς λόγος Ἑλλήνων, Θαλῆς οἱ ὁ Μιλήσιος διεβίβασε. ἀπορέοντος γὰρ Κροίσου ὅκως οἱ διαβήσεται τὸν ποταμὸν ὁ στρατός (οὐ γὰρ δὴ εἶναί κω τοῦτον τὸν χρόνον τὰς γεφύρας ταύτας) λέγεται παρεόντα τὸν Θαλῆν ἐν τῷ στρατοπέδῳ ποιῆσαι αὐτῷ τὸν ποταμὸν ἐξ ἀριστερῆς χειρὸς ῥέοντα τοῦ στρατοῦ καὶ ἐκ δεξιῆς ῥέειν, ποιῆσαι δὲ ὧδε· ἄνωθεν τοῦ στρατοπέδου ἀρξάμενον διώρυχα βαθέαν ὀρύσσειν ἄγοντα μηνοειδέα, ὅκως ἂν τὸ στρατόπεδον ἱδρυμένον κατὰ νώτου λάβοι, ταύτῃ κατὰ τὴν διώρυχα ἐκτραπόμενος

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ἐκ τῶν ἀρχαίων ῥεέθρων, καὶ αὖτις παραμειβόμενος τὸ στρατόπεδον ἐς τὰ ἀρχαῖα ἐσβάλλοι, ὥστε ἐπείτε καὶ ἐσχίσθη τάχιστα ὁ ποταμὸς ἀμφοτέρῃ διαβατὸς ἐγένετο.

65 Useful also was the opinion, before the destruction of Ionia, of Thales, a man of Miletus, being a Phoenician by ultimate descent, who advised the Ionians to have a single deliberative chamber, saying that it should be in Teos, for this was in the middle of Ionia; the other cities should continue to be inhabited but should be regarded as if they were demes.

66 When he came to the Halys river, Croesus then, as I say, put his army across by the existing bridges; but, according to the common account of the Greeks, Thales the Milesian transferred the army for him. For it is said that Croesus was at a loss how his army should cross the river, since these bridges did not yet exist at this period; and that Thales, who was present in the army, made the river, which flowed on the left hand of the army, flow on the right hand also. He did so in this way: beginning upstream of the army he dug a deep channel, giving it a crescent shape, so that it should flow round the back of where the army was encamped, being diverted in this way from its old course by the channel, and passing the camp should flow into its old course once more. The result was that as soon as the river was divided it became fordable in both its parts.

Herodotus provides important evidence for Thales' activities as statesman and engineer (also as astronomer, **74**). Such versatility seems to have been typical of the Milesian thinkers, whom it is tempting to consider too exclusively as theoretical physicists. Thales, especially, became a symbol for ingenuity of a mathematical and geometrical kind: ἄνθρωπος Θαλῆς ('the man's a Thales'), says a character in Aristophanes (*Birds* 1009) of Meton the town-planner; and Plato (*Rep.* 600A) coupled him with Anacharsis. Herodotus, it is true, did not believe the story in **66** about Thales diverting the river Halys, but he did not deny that this is the sort of thing Thales might have done. There probably were crossings over the Halys, but Croesus' army might not have found them; Herodotus was rightly cautious, although the grounds of his suspicion were not certainly correct. He went on to mention a variant account by which the river was totally diverted into a new bed; the story, therefore, may have been widespread. The circumstantial and restrained nature of the version of **66** suggests that it contained a kernel of truth.[1]

[1] For a far more sceptical account of Thales' ideas one can refer to D. R. Dicks, *CQ* N.S. 9 (1959), 294–309.

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TRADITION OF A VISIT TO EGYPT

67 Aetius I, 3, 1 Θαλῆς...φιλοσοφήσας δὲ ἐν Αἰγύπτῳ ἦλθεν εἰς Μίλητον πρεσβύτερος.

68 Proclus *in Euclidem* p. 65 Friedl. (from Eudemus) (DK 11 A 11) Θαλῆς δὲ πρῶτον εἰς Αἴγυπτον ἐλθὼν μετήγαγεν εἰς τὴν Ἑλλάδα τὴν θεωρίαν ταύτην (*sc.* τὴν γεωμετρίαν)...

67 Thales...having practised philosophy in Egypt came to Miletus when he was older.

68 Thales, having first come to Egypt, transferred this study [geometry] to Greece...

It was the custom to credit the sixth-century sages (notably, for example, Solon) with visits to Egypt, the traditional fountain-head of Greek science. Thales as the earliest known Greek geometer had a special reason for being associated with the home of land-measurement.[1] The implication of **67** that he spent a considerable time there is unique and not persuasive. That he did visit Egypt, however, is possible enough; several of his achievements are quite plausibly located there (e.g. **79**; see also p. 88), and Miletus' relations with its colony Naucratis were so close as to make a visit by any prominent citizen, trader or not, perfectly feasible.

[1] Cf. **69** Herodotus II, 109 δοκέει δέ μοι ἐνθεῦτεν γεωμετρίη εὑρεθεῖσα εἰς τὴν Ἑλλάδα ἐπανελθεῖν. *(It seems to me that geometry was discovered from this source* [sc. *re-measurement of holdings after the Nile flood] and so came to Greece.)*

Further, Thales appears in Aetius as the holder of a theory about the flooding of the Nile which is one of three already recorded by Herodotus:

70 Herodotus II, 20 (there are two particularly improbable theories about the cause of the flood) τῶν ἡ ἑτέρη μὲν λέγει τοὺς ἐτησίας ἀνέμους εἶναι αἰτίους πληθύειν τὸν ποταμόν, κωλύοντας ἐς θάλασσαν ἐκρέειν τὸν Νεῖλον.

71 Aetius IV, 1, 1 Θαλῆς τοὺς ἐτησίας ἀνέμους οἴεται πνέοντας τῇ Αἰγύπτῳ ἀντιπροσώπους ἐπαίρειν τοῦ Νείλου τὸν ὄγκον διὰ τὸ τὰς ἐκροὰς αὐτοῦ τῇ παροιδήσει τοῦ ἀντιπαρήκοντος πελάγους ἀνακόπτεσθαι.

70 Of these, one theory says that the Etesian winds are the cause of the river flooding, by preventing the Nile from running out into the sea.

71 Thales thinks that the Etesian winds, blowing straight on to

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Egypt, raise up the mass of the Nile's water through cutting off its outflow by the swelling of the sea coming against it.

Aetius probably depends on a lost Peripatetic treatise, of which traces have survived in other sources (Diels, *Doxographi Graeci* 226f.): therefore his information may be reliable and not, as is nevertheless possible, a purely speculative ascription. If Thales did advance this theory then he may have seen the Nile himself; though it should be remembered that he could easily have got the relevant information (that the Etesian winds blow in Egypt too), and even the idea, from Milesian traders.

ANECDOTES ABOUT THALES AS THE TYPICAL PHILOSOPHER

72 Plato *Theaetetus* 174A ...ὥσπερ καὶ Θαλῆν ἀστρονομοῦντα, ὦ Θεόδωρε, καὶ ἄνω βλέποντα, πεσόντα εἰς φρέαρ, Θρᾷττά τις ἐμμελὴς καὶ χαρίεσσα θεραπαινὶς ἀποσκῶψαι λέγεται, ὡς τὰ μὲν ἐν οὐρανῷ προθυμοῖτο εἰδέναι, τὰ δ' ὄπισθεν αὐτοῦ καὶ παρὰ πόδας λανθάνοι αὐτόν.

73 Aristotle *Politics* A11, 1259a9 ὀνειδιζόντων γὰρ αὐτῷ διὰ τὴν πενίαν ὡς ἀνωφελοῦς τῆς φιλοσοφίας οὔσης, κατανοήσαντά φασιν αὐτὸν ἐλαιῶν φορὰν ἐσομένην ἐκ τῆς ἀστρολογίας, ἔτι χειμῶνος ὄντος, εὐπορήσαντα χρημάτων ὀλίγων ἀρραβῶνας διαδοῦναι τῶν ἐλαιουργείων τῶν τ' ἐν Μιλήτῳ καὶ Χίῳ πάντων, ὀλίγου μισθωσάμενον ἅτ' οὐδενὸς ἐπιβάλλοντος. ἐπειδὴ δ' ὁ καιρὸς ἦκε, πολλῶν ζητουμένων ἅμα καὶ ἐξαίφνης, ἐκμισθοῦντα ὃν τρόπον ἠβούλετο πολλὰ χρήματα συλλέξαντα ἐπιδεῖξαι ὅτι ῥᾴδιόν ἐστι πλουτεῖν τοῖς φιλοσόφοις ἂν βούλωνται, ἀλλ' οὐ τοῦτ' ἐστὶ περὶ ὃ σπουδάζουσιν. (Cf. also Diog. L. 1, 26 (DK 11A1), from Hieronymus of Rhodes, and Cicero *Div.* 1, 49, 111.)

72 ...just as, Theodorus, a witty and attractive Thracian servant-girl is said to have mocked Thales for falling into a well while he was observing the stars and gazing upwards; declaring that he was eager to know the things in the sky, but that what was behind him and just by his feet escaped his notice.

73 For when they reproached him because of his poverty, as though philosophy were no use, it is said that, having observed through his study of the heavenly bodies that there would be a large olive-crop, he raised a little capital while it was still winter, and paid deposits on all the olive presses in Miletus and Chios, hiring them cheaply because no one bid against him. When the

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appropriate time came there was a sudden rush of requests for the presses; he then hired them out on his own terms and so made a large profit, thus demonstrating that it is easy for philosophers to be rich, if they wish, but that it is not in this that they are interested.

Neither of these stories is likely to be strictly historical, even though they originated in the fourth century B.C. at the latest, before the great period of fictitious biography in the third and second centuries. They well demonstrate how at a comparatively early date Thales had become accepted as the typical philosopher; though **72**, one of the oldest versions of the absent-minded professor theme, would have had more point if applied to someone not so notoriously practical in his interests as Thales. The detail of the witty slave-girl is added to make the whole situation more piquant; possibly it is a vestige of a separate and mildly malicious joke at the philosopher's expense. Plato liked making fun of the Presocratics, a truth frequently overlooked in the interpretation of certain less obvious passages.

THE PREDICTION OF THE ECLIPSE, AND OTHER ASTRONOMICAL ACTIVITIES

74 Herodotus I, 74 διαφέρουσι δέ σφι (*sc.* τοῖσι Λυδοῖσι καὶ τοῖσι Μήδοισι) ἐπ' ἴσης τὸν πόλεμον τῷ ἕκτῳ ἔτει συμβολῆς γενομένης συνήνεικε ὥστε τῆς μάχης συνεστεώσης τὴν ἡμέρην ἐξαπίνης νύκτα γενέσθαι. τὴν δὲ μεταλλαγὴν ταύτην τῆς ἡμέρης Θαλῆς ὁ Μιλήσιος τοῖσι Ἴωσι προηγόρευσε ἔσεσθαι, οὖρον προθέμενος ἐνιαυτὸν τοῦτον ἐν τῷ δὴ καὶ ἐγένετο ἡ μεταβολή.

75 Diogenes Laertius I, 23 δοκεῖ δὲ κατά τινας πρῶτος ἀστρολογῆσαι καὶ ἡλιακὰς ἐκλείψεις καὶ τροπὰς προειπεῖν, ὥς φησιν Εὔδημος ἐν τῇ περὶ τῶν ἀστρολογουμένων ἱστορίᾳ· ὅθεν αὐτὸν καὶ Ξενοφάνης καὶ Ἡρόδοτος θαυμάζει. μαρτυρεῖ δ' αὐτῷ καὶ Ἡράκλειτος καὶ Δημόκριτος.

76 Dercyllides *ap.* Theon. Smyrn. p. 198, 14 Hiller Εὔδημος ἱστορεῖ ἐν ταῖς Ἀστρολογίαις ὅτι Οἰνοπίδης εὗρε πρῶτος τὴν τοῦ ζῳδιακοῦ λόξωσιν [Diels; διάζωσιν ms] καὶ τὴν τοῦ μεγάλου ἐνιαυτοῦ περίστασιν, Θαλῆς δὲ ἡλίου ἔκλειψιν καὶ τὴν κατὰ τὰς τροπὰς αὐτοῦ περίοδον, ὡς οὐκ ἴση ἀεὶ συμβαίνει.

74 In the sixth year of the war, which they [Medes and Lydians] had carried on with equal fortunes, an engagement took place in which it turned out that when the battle was in progress the day

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suddenly became night. This alteration of the day Thales the Milesian foretold to the Ionians, setting as its limit this year in which the change actually occurred.

75 Some think he was the first to study the heavenly bodies and to foretell eclipses of the sun and solstices, as Eudemus says in his history of astronomy; for which reason both Xenophanes and Herodotus express admiration; and both Heraclitus and Democritus bear witness for him.

76 Eudemus relates in the *Astronomy* that Oenopides first discovered the obliquity of the Zodiac and the cycle of the Great Year, and Thales the eclipse of the sun and the variable period of its solstices.

The prediction of the eclipse must have been based on a long series of empirical observations, not upon a scientific theory of the true cause of eclipses. The cause was unknown to Thales' immediate successors in Miletus and therefore, presumably, to him. If the contrary was implied by Eudemus in **76** (it is asserted by Aetius, e.g. II, 24, 1, DK 11 A 17*a*), then Eudemus was guilty of drawing a wrong conclusion from the undoubted fact of Thales' prediction. The Babylonian priests had made observations of eclipses of the sun, both partial and total, for religious purposes, at any rate since 721 B.C.; and by the sixth century they had probably established a cycle of solstices (or less plausibly of lunations) within which eclipses might occur at certain points. It is overwhelmingly probable that Thales' feat depended on his access to these Babylonian records; see further Kahn, *Anaximander and the Origins of Greek Cosmology* (New York, 1960), p. 76 n. 2. We know that many cultivated Greeks visited Sardis at this period,[1] and relations with Ionia were naturally particularly close. Some scholars have argued that Thales' information more probably came from Egypt, with which he had other contacts; but there is no evidence that sufficiently detailed observations, over a long enough period, were made and recorded by the Egyptian priests. Even on the Babylonian data it could not be predicted that an eclipse would be visible at a particular point. Priests were despatched to different parts of the Babylonian empire when a possible eclipse was due, and even within this large area the expected phenomenon was sometimes not visible. Further, no precise date could be predicted, only broad limits of time. Thus Thales appears to have said that an eclipse was likely to occur within a certain year.[2] It was pure chance that it happened on the day of the battle and so seemed especially remarkable, and to some degree a matter of luck that it was visible near the Ionian area at all.

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[1] **77** Herodotus I, 29 ...ἀπικνέονται ἐς Σάρδις ἀκμαζούσας πλούτῳ ἄλλοι τε οἱ πάντες ἐκ τῆς Ἑλλάδος σοφισταί...καὶ δὴ καὶ Σόλων... (*...there arrived at Sardis in this bloom of its wealth all the sages from Greece...among whom came Solon...*).

[2] Some scholars have felt a whole year to be too large a period, and have tried to restrict the meaning of ἐνιαυτόν in **74** to the summer solstice (by which the year-interval could be gauged); but there is no satisfactory evidence for such a usage.

The information added by Eudemus in **75** and **76**, that Thales predicted solstices and noted that their cycle is not always equal (by which is probably meant the slight variations in length of the solar seasons, as divided by solstices and equinoxes), is more straightforward. All that would be needed would be a rather long series of observations with a solstice-marker, a ἡλιοτρόπιον of some kind, such as was connected with Pherecydes (**47**), to mark the bearings of the sun at its most northerly and southerly points in the year – that is, the summer and winter solstices. Alternatively a *gnomon* or stable vertical rod, by which the length of the sun's shadow could be exactly recorded, would suffice. This was said by Herodotus to be a Babylonian invention (**97**), and its introduction was credited to Anaximander and not to Thales (**94**). However, measurement of shadows was certainly involved in the computation of the height of pyramids ascribed to Thales (p. 85), and one cannot be completely confident that the observation of the sun's zenith by similar means was unknown to him. The technique seems obvious to us now, and might be thought to have occurred to anyone who had reached Thales' by no means primitive stage of celestial observation. Diogenes (I, 24, DK 11 A 1) added that Thales discovered the passage of the sun from solstice to solstice, and the relation of the diameter of sun and moon to their orbits. The former phrase is very vague, and might imply no more than the knowledge that the sun moves between the tropics – which Thales obviously possessed. But it perhaps refers to the discovery of the inclination of the Zodiac, which Eudemus in **76** ascribed to Oinopides of Chios over a century later. Diogenes' second piece of information is quite anachronistic, for Thales cannot have thought that the heavenly bodies had orbits, since they did not pass under the earth (which was not made free-swinging until Anaximander); at the most they had semi-orbits, and the ratio of diameter to celestial path would be twice that given.[1]

[1] The determination of this ratio was a recurrent problem in Greek astronomy, which might naturally come to be associated with the earliest known astronomer. The ratio suggested in Diogenes, 1:720, implies a sexagesimal measurement of the circle of the ecliptic such as was adopted by the Babylonians: so A. Wasserstein, *JHS* 75 (1955), 114–16. Cf. Herodotus II, 109 (**97**), also II, 4.

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One further observation is attributed to Thales, again with a possible implication that he may be indebted to foreign sources:

78 Callimachus *Iambus* 1, 52, fr. 191 Pfeiffer (DK 11 A 3*a*)

...ἦν γὰρ ἡ νίκη
Θάλητος, ὃς τ' ἦν ἄλλα δεξιὸς γνώμην
καὶ τῆς Ἀμάξης ἐλέγετο σταθμήσασθαι
τοὺς ἀστερίσκους, ἣ πλέουσι Φοίνικες.

78 ...for the victory belonged to Thales, who was clever in judgement, not least because he was said to have measured out the little stars of the Wain, by which the Phoenicians sail.

This is part of the apocryphal story of the cup (in some versions, tripod) which had to be presented to the wisest man living: Thales was the first, and in some versions also the final, choice, but he modestly sent it on to Bias, and he to others of the Seven Sages. The 'little stars of the Wain' are the Little Bear (cf. Aratus *Phaen.* 39, with scholion); this constellation, because its revolution is smaller, provides a more accurate fixed point than the Great Bear or Wain as a whole (as opposed to the Pole star itself). σταθμᾶσθαι strictly means 'to measure', but sometimes, more vaguely, 'to mark out, define' (Σ on Pindar *Ol.* 10, 53). The probable meaning is that Thales defined the Little Bear, and drew the attention of Milesian sailors to its navigational usefulness. Diogenes Laertius, 1, 23, interpreted the lines of Callimachus as meaning simply that Thales 'discovered' the Little Bear. Ionian sailors may previously have neglected it, since for all except long open-sea crossings the more conspicuous Great Bear was adequate.

Thus the ἀστρολογία, the study of heavenly bodies, mentioned as characteristic of Thales by Plato (**72**) and Aristotle (**73**),[1] seems to have comprised these activities: the lucky prediction of an eclipse, probably with the aid of Babylonian tables; the measurement of solstices and their variations, possibly undertaken in part for calendar-making purposes; and the study of star-groups, perhaps mainly as a navigational aid.

[1] Cf. also **75**, where nothing is otherwise known of the references to Thales by Xenophanes, Heraclitus and Democritus.

MATHEMATICAL DISCOVERIES

79 Diogenes Laertius 1, 27 ὁ δὲ Ἱερώνυμος καὶ ἐκμετρῆσαί φησιν αὐτὸν τὰς πυραμίδας ἐκ τῆς σκιᾶς, παρατηρήσαντα ὅτε ἡμῖν ἰσομεγέθης ἐστίν.

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80 Proclus *in Euclidem* p. 352 Friedl. (DK 11 A 20) Εὔδημος δὲ ἐν ταῖς Γεωμετρικαῖς ἱστορίαις εἰς Θαλῆν τοῦτο ἀνάγει τὸ θεώρημα (*sc.* that triangles having one side and its adjacent angles equal are themselves equal)· τὴν γὰρ τῶν ἐν θαλάττῃ πλοίων ἀπόστασιν δι' οὗ τρόπου φασὶν αὐτὸν δεικνύναι τούτῳ προσχρῆσθαί φησιν ἀναγκαῖον.

> **79** Hieronymus says that he [Thales] actually measured the pyramids by their shadow, having observed the time when our own shadow is equal to our height.
>
> **80** Eudemus in the *History of Geometry* refers this theorem to Thales; for the method by which they say he demonstrated the distance of ships out at sea must, he says, have entailed the use of this theorem.

In **79** Hieronymus of Rhodes attributes to Thales the simplest possible method of measuring the height of a pyramid. Thales might conceivably have learned this from the Egyptians; or it is not impossible that the pyramids were merely local colour, to fit the tradition of a visit to Egypt. Pliny (*N.H.* XXXVI, 82, DK 11 A 21) gave the same account, but a more complex variant appears in Plutarch, *Sept. sap. conv.* 2, 147A (DK 11 A 21), that the height of a pyramid is related to the length of its shadow exactly as the height of any mensurable vertical object is related to the length of *its* shadow at the same time of day. It is probable, though not certain, that Hieronymus is here dependent on his near-contemporary Eudemus (whose book on the history of geometry and mathematics, as opposed to his history of astronomy, Diogenes himself does not appear to have used for Thales); if so, there is a probability that Thales used the simpler method. On the other hand, the more complex one is based on an argument from similar triangles analogous to that ascribed to him by Eudemus in **80**, as a means of measuring the distance of ships out at sea. Provided the height of the observer above sea-level were known, this calculation could be made with the aid of a primitive theodolite, two sticks (one as a sight-line, the other as an approximate level-line) pivoting on a nail. It is to be observed that Eudemus credited Thales with a knowledge of similar triangles only on the *a priori* ground that he could not otherwise have performed this kind of calculation. Yet a man may make an empirical use of a rudimentary angle-measurer without forming an explicit theory about the principles involved, and certainly without stating those principles as a geometer.[1] Three other theorems attributed to Thales by Proclus following Eudemus, in the same commentary as **80** (DK 11 A 11) – circle bisected by diameter; angles at base of isosceles triangle are

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equal; vertically opposed angles are equal – are, again, probably just the neatest abstract solutions of particular practical problems associated with Thales. All this is very much a matter for conjecture: my own guess would be that Thales did gain a reputation with his contemporaries for carrying out various far from straightforward empirical feats of mensuration, without necessarily stating the geometry that lay behind them. This is perhaps confirmed by the fact that Thales' Milesian successors seem to have paid little attention to mathematical theory.

[1] Burnet, *EGP*, 45f., observed that a knowledge of the Egyptian *seqt* ratio (a trigonometrical approximation) could have produced a solution of both problems. In view of the possibility of Thales' acquaintance with Egypt, and his analogous use (it is assumed) of an empirical Babylonian formula, this explanation can by no means be excluded. – Pamphila's report in Diog. L. 1, 24 that Thales inscribed a right-angled triangle in a circle 'and sacrificed an ox' is entertaining, if not convincing (cf. pp. 334f. below).

WRITINGS

81 Simplicius *in Phys.* p. 23, 29 Diels Θαλῆς δὲ πρῶτος παραδέδοται τὴν περὶ φύσεως ἱστορίαν τοῖς Ἕλλησιν ἐκφῆναι, πολλῶν μὲν καὶ ἄλλων προγεγονότων, ὡς καὶ Θεοφράστῳ δοκεῖ, αὐτὸς δὲ πολὺ διενεγκὼν ἐκείνων ὡς ἀποκρύψαι πάντας τοὺς πρὸ αὐτοῦ. λέγεται δὲ ἐν γραφαῖς μηδὲν καταλιπεῖν πλὴν τῆς καλουμένης Ναυτικῆς ἀστρολογίας.

82 Diogenes Laertius 1, 23 καὶ κατά τινας μὲν σύγγραμμα κατέλιπεν οὐδέν· ἡ γὰρ εἰς αὐτὸν ἀναφερομένη Ναυτικὴ ἀστρολογία Φώκου λέγεται εἶναι τοῦ Σαμίου. Καλλίμαχος δ' αὐτὸν οἶδεν εὑρετὴν τῆς ἄρκτου τῆς μικρᾶς λέγων ἐν τοῖς Ἰάμβοις οὕτως... [**78**, ll. 3–4], κατά τινας δὲ μόνα δύο συνέγραψε Περὶ τροπῆς καὶ Ἰσημερίας, τὰ ἄλλ' ἀκατάληπτα εἶναι δοκιμάσας.

83 Suda s.v. (from Hesychius) (DK 11 A 2) ...ἔγραψε περὶ μετεώρων ἐν ἔπεσι, περὶ ἰσημερίας, καὶ ἄλλα πολλά.

81 Thales is traditionally the first to have revealed the investigation of nature to the Greeks; he had many predecessors, as also Theophrastus thinks, but so far surpassed them as to blot out all who came before him. He is said to have left nothing in the form of writings except the so-called 'Nautical Star-guide'.

82 And according to some he left no book behind; for the 'Nautical Star-guide' ascribed to him is said to be by Phokos the Samian. Callimachus knew him as the discoverer of the Little Bear,

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and wrote as follows in his *Iambs*... [**78**, lines 3–4]; while according to some he wrote only two works, *On the Solstice* and *On the Equinox*, considering the rest to be incomprehensible.

83 ...he wrote on celestial matters in epic verse, on the equinox, and much else.

These passages show that there was profound doubt in antiquity about Thales' written works. It is plain, at all events, that there was no work by him in the Alexandrian library, except the dubious 'Nautical Star-guide' (cf. also **96**). Aristotle appears not to have seen any book by him, at least on cosmological matters; he was extremely cautious in ascribing opinions to him, using the expressions 'deriving the supposition perhaps from...', 'the account which they say Thales gave' (**85, 84**), and 'from what they relate' (**89**). Aristotle was not necessarily conscientious in using original sources; Theophrastus, as a professed historian of earlier philosophy, should have been conscientious (though he was not always so, in fact), but he evidently had little to add to Aristotle about Thales (except for the minor amendment implied by the conjecture in **81** that Thales *did* have predecessors). Eudemus made some positive assertions about Thales as geometer and astronomer (**75, 76, 80**), but we have seen on **80** that these were sometimes very speculative; they were perhaps partly based on the quasi-legendary biographical tradition, and do not imply that Eudemus had seen written works by Thales.

Diogenes' doubt in **82** about the 'Nautical Star-guide' was shared by Plutarch, *de Pyth. or.* 18, 402E (DK 11B1), who added that the work in question was in verse; we may thus conjecture that this was the verse work described by Hesychius in **83** as περὶ μετεώρων. Lobon of Argos (a disreputable stichometrist of the second century B.C.), according to Diog. L. 1, 34, said that Thales wrote 200 hexameters. Only mild suspicion is expressed in **81**, where any uncertainty implied by καλουμένης is perhaps restricted to the nature of the title. But this last sentence almost certainly contains Simplicius' own judgement and not that of Theophrastus, the paraphrase of whom seems to end before λέγεται. Diogenes' information in **82**, that the work was also ascribed to one Phokos of Samos, almost settles the matter; any astronomical work of archaic appearance might naturally be credited to Thales, but works actually by Thales would not be alternatively ascribed to men of comparative obscurity. It is possible that the 'Nautical Star-guide' was a genuine sixth-century work similar to the hexameter Ἀστρολογία of Cleostratus of Tenedos (DK ch. 6) or the so-called Hesiodic Ἀστρονομίη (DK ch. 4): so Diels

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and others have assumed. It is also possible that it was a Hellenistic forgery. Diogenes in **82** is a little worried by Callimachus' mention in **78** of a particular nautical star-aid ascribed to Thales; but this need not have been described by Thales in writing. However, there is nothing inherently improbable in Thales having recorded such aids to navigation, a plausible enough activity for a practical sage in a maritime centre: but it was probably not in the 'Nautical Star-guide' known to the Hellenistic world that he did so. The other works mentioned in **82**, on the solstice and the equinox (only the latter in **83**), are unlikely, from their similar contents, to have been separate books. Simplicius in **81**, and those recorded in **82** who thought that Thales left no book, evidently did not accept this work as genuine. Thales studied the solstices according to Eudemus in **75** and **76**, and it would be on the ground of this known interest that such a work would be ascribed to him. Once again, however, it must be remembered that observations of solstices and of star-risings and -settings were widely made in the archaic period, and also set down in verse, partly in the attempt to establish a satisfactory calendar: see Cleostratus fr. 4 (DK6B4) and the Hesiodic *Astronomy* (DK4B1–5). Observations about the Hyades and the setting of the Pleiades were also attributed to Thales (scholion on Aratus 172, Pliny *N.H.* XVIII, 213; DK 11 B 2, 11 A 18); the latter observation, incidentally, was accurate for the latitude of Egypt, not that of Greece.

The evidence does not allow a certain conclusion, but the probability is that Thales did not write a book; though the ancient holders of this view might have been misled by the absence of a genuine work from the Alexandrian library, and also by the apophthegmatic nature of the wisdom assigned to the Seven Sages in general.

COSMOLOGY

(i) *The earth floats on water, which is in some way the source of all things*

84 Aristotle *de caelo* B13, 294a28 οἱ δ' ἐφ' ὕδατος κεῖσθαι (*sc.* φασὶ τὴν γῆν). τοῦτον γὰρ ἀρχαιότατον παρειλήφαμεν τὸν λόγον, ὃν φασιν εἰπεῖν Θαλῆν τὸν Μιλήσιον, ὡς διὰ τὸ πλωτὴν εἶναι μένουσαν ὥσπερ ξύλον ἢ τι τοιοῦτον ἕτερον (καὶ γὰρ τούτων ἐπ' ἀέρος μὲν οὐθὲν πέφυκε μένειν, ἀλλ' ἐφ' ὕδατος), ὥσπερ οὐ τὸν αὐτὸν λόγον ὄντα περὶ τῆς γῆς καὶ τοῦ ὕδατος τοῦ ὀχοῦντος τὴν γῆν.

85 Aristotle *Met.* A3, 983b6 τῶν δὴ πρῶτον φιλοσοφησάντων οἱ πλεῖστοι τὰς ἐν ὕλης εἴδει μόνας ᾠήθησαν ἀρχὰς εἶναι πάντων· ἐξ οὗ

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γὰρ ἔστιν ἅπαντα τὰ ὄντα, καὶ ἐξ οὗ γίγνεται πρώτου καὶ εἰς ὃ φθείρεται τελευταῖον, τῆς μὲν οὐσίας ὑπομενούσης τοῖς δὲ πάθεσι μεταβαλλούσης, τοῦτο στοιχεῖον καὶ ταύτην ἀρχήν φασιν εἶναι τῶν ὄντων, καὶ διὰ τοῦτο οὔτε γίγνεσθαι οὐδὲν οἴονται οὔτ' ἀπόλλυσθαι, ὡς τῆς τοιαύτης φύσεως ἀεὶ σῳζομένης... δεῖ γὰρ εἶναί τινα φύσιν ἢ μίαν ἢ πλείους μιᾶς ἐξ ὧν γίγνεται τἆλλα σῳζομένης ἐκείνης. τὸ μέντοι πλῆθος καὶ τὸ εἶδος τῆς τοιαύτης ἀρχῆς οὐ τὸ αὐτὸ πάντες λέγουσιν, ἀλλὰ Θαλῆς μὲν ὁ τῆς τοιαύτης ἀρχηγὸς φιλοσοφίας ὕδωρ εἶναί φησιν (διὸ καὶ τὴν γῆν ἐφ' ὕδατος ἀπεφαίνετο εἶναι), λαβὼν ἴσως τὴν ὑπόληψιν ταύτην ἐκ τοῦ πάντων ὁρᾶν τὴν τροφὴν ὑγρὰν οὖσαν καὶ αὐτὸ τὸ θερμὸν ἐκ τούτου γιγνόμενον καὶ τούτῳ ζῶν (τὸ δ' ἐξ οὗ γίγνεται, τοῦτ' ἐστὶν ἀρχὴ πάντων), διά τε δὴ τοῦτο τὴν ὑπόληψιν λαβὼν ταύτην καὶ διὰ τὸ πάντων τὰ σπέρματα τὴν φύσιν ὑγρὰν ἔχειν· τὸ δ' ὕδωρ ἀρχὴ τῆς φύσεως ἐστὶ τοῖς ὑγροῖς.

84 Others say that the earth rests on water. For this is the most ancient account we have received, which they say was given by Thales the Milesian, that it stays in place through floating like a log or some other such thing (for none of these rests by nature on air, but on water) – as though the same argument did not apply to the water supporting the earth as to the earth itself.

85 Most of the first philosophers thought that principles in the form of matter were the only principles of all things; for the original source of all existing things, that from which a thing first comes-into-being and into which it is finally destroyed, the substance persisting but changing in its qualities, this they declare is the element and first principle of existing things, and for this reason they consider that there is no absolute coming-to-be or passing away, on the ground that such a nature is always preserved... for there must be some natural substance, either one or more than one, from which the other things come-into-being, while it is preserved. Over the number, however, and the form of this kind of principle they do not all agree; but Thales, the founder of this type of philosophy, says that it is water (and therefore declared that the earth is on water), perhaps taking this supposition from seeing the nurture of all things to be moist, and the warm itself coming-to-be from this and living by this (that from which they come-to-be being the principle of all things) – taking the supposition both from this and from the seeds of all things having a moist nature, water being the natural principle of moist things.

Our knowledge of Thales' cosmology depends virtually completely on these two passages, with the cryptic addition of **89–91**. Apart from

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Aristotle's own criticism and conjecture, they assign two propositions to Thales: (1) the earth floats on water (like a piece of wood or something of the sort); (2) the 'principle' of all things is water (in Aristotle's sense of ἀρχή as explained in the first half of **85**, i.e. the original constituent material of things, which persists as a substratum and into which they will perish). (1) was professedly known to Aristotle only indirectly, on the information of others; further, it is impossible to tell whether the supporting argument (solid things do not rest on air, but they do on water, therefore the earth floats on water) was also derived from the reports of Thales, or whether it was entirely supplied by Aristotle. His final objection, that Thales has solved nothing because he would still have to find something to support the water that supports the earth, shows how little Aristotle understood the probable nature of Thales' way of thinking; Thales would almost certainly still accept the popular conception of the underparts of earth stretching down so far that the problem almost disappeared, as in Homer (**1**) and long after Thales in Xenophanes (**3**). The probable direct origin of Thales' idea of the earth floating on water was from non-Greek mythological accounts (pp. 92f.); the device might have attracted him in part because it provided support for the earth, but it is by no means certain that Thales felt this to be a serious problem, and most improbable in any case that he worked out the theory for himself as a conscious answer to that problem. As for proposition (2), Aristotle evidently knew nothing beyond what he wrote, since the reasons given for Thales' choice of water are professedly conjectural (λαβὼν ἴσως...). The first half of **85** is quoted to show the kind of analysis and terminology which Aristotle (and following him Theophrastus[1] and thus the subsequent doxographical tradition) applied to the early physicists or natural philosophers, the φυσικοί – those who, according to Aristotle, posited solely, or primarily, the first (material) of his four causes. His application of a single rigid analysis to his predecessors, while justly and usefully emphasizing certain resemblances between them, is also a source of confusion. Thus Thales' 'principle' (in Aristotle's sense) and Heraclitus' 'principle' (fire according to Aristotle) were clearly, for Thales and for Heraclitus themselves, very different kinds of thing. In fact, all we know about Thales' views on water (apart from that the earth floats on it) is that, in a hearsay and probably much abbreviated and somewhat distorted form, they appeared to the not over-discriminating Aristotle to fit his own idea of a material ἀρχή. Yet it is possible, contrary to Aristotle's automatic assumption, that Thales declared earth to *come from* water (i.e. to be solidified out of

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it in some way) without therefore thinking that the earth and its contents *are* somehow water, that they have any continuing relation to it (beyond the fact that the earth floats on water) except perhaps that of a man to his remote ancestors. See further pp. 93f.

[1] Theophrastus' abbreviated account of Thales' material principle is given by Simplicius, *in Phys.* p. 23, 21 Diels (= Theophrastus *Phys. op.* fr. 1), DK 11 A 13. It is a close parallel of Aristotle in **85**, using in many parts the same phraseology. It adds one more conjectural reason for Thales' choice of water, that corpses dry up (τὰ νεκρούμενα ξηραίνεται): this perhaps came from Hippon (see next n.), who is probably credited with a similar argument in Anon. Lond. XI, 22 (DK 38 A 11), i.e. in a Peripatetic source. The addition occurs also in Aetius.

The reasons conjectured by Aristotle in **85** for the importance attached by Thales to water as a constituent of things are mainly physiological.[1] From the analogy of his immediate successors we might have expected Thales to have adduced meteorological reasons, more conspicuously, in support of the cosmic importance of water.[2] Yet we must beware of exaggerated generalizations like that implied in Burnet's view that sixth-century thinkers were almost exclusively interested in meteorological (in the strict sense, including astronomical) phenomena. It is undoubtedly true that the *scientific* study of medicine began in the fifth century B.C., and that analogies between the world and details of human structure become much commoner then. Yet chapter 1 has shown the strongly genealogical colouring of much pre-philosophical Greek speculation, and also the importance of the analogy of physiological reproduction. In the case of Thales there are reasons for thinking that his explanation of the world was influenced not only by this variegated traditional background of earlier Greek quasi-mythological cosmogonical versions, but also by a specific cosmological idea derived directly, perhaps, from further east.

[1] It seems more probable than not that Aristotle took them from Hippon of Samos (or of Rhegium, Croton, or Metapontum), who in the second half of the fifth century B.C. revived and modified the idea of water as constituent material of things. Hippon, whose intellect Aristotle did not admire, evidently had strong physiological interests. Cf. in particular **86** Aristotle *de an.* A 2, 405b1 τῶν δὲ φορτικωτέρων καὶ ὕδωρ τινὲς ἀπεφήναντο (*sc.* τὴν ψυχήν), καθάπερ Ἵππων· πεισθῆναι δ' ἐοίκασιν ἐκ τῆς γονῆς, ὅτι πάντων ὑγρά· καὶ γὰρ ἐλέγχει τοὺς αἷμα φάσκοντας τὴν ψυχήν, ὅτι ἡ γονὴ οὐχ αἷμα. *(Of the cruder thinkers some actually declared it [*sc. *the soul] to be water, like Hippon; they seem to have been persuaded by the seed of all things being moist. In fact he refutes those who say that the soul is blood; because the seed is not blood.)* Note that there is a good deal of conjecture in this, too. Against the assumption that Aristotle's conjectured reasons for Thales' choice of water were derived from Hippon is that the additional reason given in

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Theophrastus (see previous note) probably did come from Hippon, and might therefore have been expected to be included by Aristotle.

[2] As in **87** Heraclitus Homericus *Quaest. Hom.* 22 ἡ γὰρ ὑγρὰ φύσις, εὐμαρῶς εἰς ἕκαστα μεταπλαττομένη, πρὸς τὸ ποικίλον εἴωθε μορφοῦσθαι· τό τε γὰρ ἐξατμιζόμενον αὐτῆς ἀεροῦται, καὶ τὸ λεπτότατον ἀπὸ ἀέρος αἰθὴρ ἀνάπτεται, συνιζάνον τε τὸ ὕδωρ καὶ μεταβαλλόμενον εἰς ἰλὺν ἀπογαιοῦται· διὸ δὴ τῆς τετράδος τῶν στοιχείων ὥσπερ αἰτιώτατον ὁ Θαλῆς ἀπεφήνατο στοιχεῖον εἶναι τὸ ὕδωρ. *(For moist natural substance, since it is easily formed into each different thing, is accustomed to undergo very various changes: that part of it which is exhaled is made into air, and the finest part is kindled from air into aither, while when water is compacted and changes into slime it becomes earth. Therefore Thales declared that water, of the four elements, was the most active, as it were, as a cause.)* These reasons certainly stem from a Stoic source – there is much Stoic phraseology – and may well be entirely conjectural. According to Theophrastus, evidently, Thales used water and its products to explain earthquakes (**88**: this depends on the special conception that the earth *rests on* water), also winds and movements of stars (Hippolytus *Ref.* 1, 1); but these would scarcely provide the reason for Thales adopting the theory in the first place.

The near-eastern origin of part of Thales' cosmology is indicated by his conception that the earth floats or rests on water. In Egypt the earth was commonly conceived as a flat, rimmed dish resting upon water, which also filled the sky; the sun sailed each day across the sky in a boat, and also sailed under the earth each night (not round it, as in the Greek legend, e.g. **7**). In the Babylonian creation-epic Apsu and Tiamat represent the primeval waters, and Apsu remains as the waters under the earth after Marduk has split the body of Tiamat to form sky (with its waters) and earth. In the story of Eridu (seventh century B.C. in its youngest extant version), in the beginning 'all land was sea'; then Marduk built a raft on the surface of the water, and on the raft a reed-hut which became the earth. An analogous view is implied in the Psalms (where also Leviathan is an analogue of Tiamat), where Jahweh 'stretched out the earth above the waters' (136, 6), 'founded it upon the seas, and established it upon the floods' (24, 2). Similarly Tehom is 'the deep that lieth under' (Gen. xlix. 25), 'the deep that coucheth beneath' (Deut. xxxiii. 13).[1] Against this profusion of parallel material from the east and south-east for the waters under the earth, there is no comparable Greek evidence apart from Thales. The naïve Greek conception of a river Okeanos *surrounding* the earth (ch. 1 §2) is not strictly comparable (for it is clear that there is no Okeanos under the earth), although it was probably a much earlier development, in a different direction, of the widely-diffused near-eastern generic concept of the earth rising in the midst of the primeval waters – a concept almost certainly not native to the Greek-speaking peoples, whose home before the migrations into the Greek peninsula lay far from the

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sea. Similarly, although the isolated references in *Iliad* book XIV (**8** and **9**) to Okeanos as origin of all things were also probably based upon the same near-eastern concept, from a slightly different aspect, they contain no implication of the special idea that the earth floats on water, and so are unlikely to have been the origin of Thales' assertion of this idea. For any more general contention that the earth came from, or is maintained by, water, Thales would no doubt be encouraged and gratified to have the apparently native Homeric precedents. Thus Thales' view that the earth floats on water seems to have been most probably based upon direct contact with near-eastern mythological cosmology. We have already seen that he had associations both with Babylonia and with Egypt. The idea that the earth actually floats upon water was more clearly and more widely held in the latter of these countries; and the conjecture might be hazarded that Thales was indebted to Egypt for this element of his world-picture.[2]

[1] These instances are cited by U. Hölscher in his convincing discussion of Thales, *Hermes* 81 (1953), 385–91. Some of the material is treated in ch. I, especially pp. 11ff. For the idea of Nun, the Egyptian primeval ocean, supporting the earth, see also the remarks of J. A. Wilson, *Before Philosophy* 59ff., and H. Frankfort, *Ancient Egyptian Religion* (N.Y., 1948), 114.

[2] Thales evidently used the floating-earth idea to explain earthquakes: **88** Seneca *Qu. nat.* III, 14 (presumably from Theophrastus, through a Posidonian source): ait enim (*sc.* Thales) terrarum orbem aqua sustineri et vehi more navigii mobilitateque eius fluctuare tunc cum dicitur tremere. *(For he [Thales] said that the world is held up by water and rides like a ship, and when it is said to 'quake' it is actually rocking because of the water's movement.)*

The cosmological scope of the idea is, however, limited; and it seems reasonable to conclude from Aristotle's information in **85** that Thales also thought that the world *originated* from water, since this is implicit in the near-eastern mythologies and is stated in the Homeric Okeanos-passages which are thought to be based on those mythologies. Thales may have rationalized the idea from a Greek mythological form like the Homeric one; he may also have been directly influenced (as he seems to have been for the special detail that the earth floats on water) by foreign, perhaps Egyptian versions. Even more uncertainty attaches to a problem that has already been foreshadowed: are we justified in inferring from the Peripatetic identification of Thales' water as 'material principle' that he believed the visible, developed world to *be* water in some way? This is the normal interpretation of Thales; but it is important to realize that it rests ultimately on the Aristotelian formulation, and that Aristotle, knowing little about Thales, and that indirectly, would surely have

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found the mere information that the world originated from water sufficient justification for saying that water was Thales' material principle or ἀρχή, with the implication that water is a persistent substrate. It must be emphasized once more that no such development was necessary, and that it was not implicit in the near-eastern concepts which were ultimately Thales' archetype. Thales might have held that the world originated from an indefinite expanse[1] of primeval water, on which it still floats and which is still responsible for certain natural phenomena, without also believing that earth, rocks, trees or men are in any way *made of* water or a form of water. There would be a remote ancestral connexion, no more. On the other hand Thales *could* have made the entirely new inference that water is the continuing, hidden constituent of all things. Certainly his near successor Anaximenes believed that all things were made of air (but he had thought of a way in which this could be so: air takes on different forms when compressed or rarefied), and it is invariably assumed that he was extending and refining a line of thought initiated by Thales. It would be imprudent entirely to reject this assumption, which goes back to Theophrastus and Aristotle. The physiological reasons instanced by Aristotle, that all living things depend on water for nourishment, that the sperm is moist, and so on, although conjectural, are of a kind that might well have struck Thales. With other indications (e.g. the Homeric statement that the surrounding Okeanos is the source of all springs and rivers, **6**) they could have led him to the conclusion that water, as well as being the cosmogonical source, is also involved in the very essence of the developed world. On the other hand one must remain aware of the possibility that Aristotle was simply making his own kind of inference, in the absence of other information, from Thales' belief that the world originated from water and that water still plays a major part in the cosmos by supporting the earth.

[1] Thales would have accepted Simplicius' judgement (*in Phys.* 458, 23, DK 11 A 13) that water was, for him, ἄπειρον; though for Thales this would mean 'limitless', i.e. of indefinite extent, and not 'infinite', and be a natural assumption rather than a consciously propounded theory. Simplicius was more seriously misleading in asserting (*in Phys.* 180, 14) that Thales, like Anaximenes, generated by means of the condensation and rarefaction of his material principle. This is a purely schematic judgement based on an over-rigid dichotomy in Aristotle (**104**). Theophrastus only found the device explicitly used in Anaximenes; see **142**.

Two things, then, have emerged from the present discussion: (i) 'all things are water' is not necessarily a reliable summary of Thales'

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cosmological views; and (ii) even if we do accept Aristotle's account (with some allowance, in any event, for his inevitably altered viewpoint), we have little idea of *how* things were felt to be essentially related to water.

(ii) *Even apparently inanimate things can be 'alive'; the world is full of gods*

89 Aristotle *de an.* A2, 405a19 ἔοικε δὲ καὶ Θαλῆς, ἐξ ὧν ἀπομνημονεύουσι, κινητικόν τι τὴν ψυχὴν ὑπολαβεῖν, εἴπερ τὴν λίθον ἔφη ψυχὴν ἔχειν ὅτι τὸν σίδηρον κινεῖ.

90 Diogenes Laertius 1, 24 Ἀριστοτέλης δὲ καὶ Ἱππίας φασὶν αὐτὸν καὶ τοῖς ἀψύχοις μεταδιδόναι ψυχῆς, τεκμαιρόμενον ἐκ τῆς λίθου τῆς μαγνήτιδος καὶ τοῦ ἠλέκτρου.

91 Aristotle *de an.* A5, 411a7 καὶ ἐν τῷ ὅλῳ δέ τινες αὐτὴν (*sc.* τὴν ψυχὴν) μεμεῖχθαί φασιν, ὅθεν ἴσως καὶ Θαλῆς ᾠήθη πάντα πλήρη θεῶν εἶναι.

> **89** Thales, too, seems, from what they relate, to have supposed that the soul was something kinetic, if he said that the [Magnesian] stone possesses soul because it moves iron.
>
> **90** Aristotle and Hippias say that he gave a share of soul even to inanimate [*lit.* soulless] objects, using Magnesian stone and amber as indications.
>
> **91** And some say that it [soul] is intermingled in the universe, for which reason, perhaps, Thales also thought that all things are full of gods.

The two passages from Aristotle's *de anima* allow us to conjecture, but no more, about Thales' vision of the whole world as somehow alive and animated. Aristotle himself was reporting second-hand evidence, and his statements are jejune and cautious (although in **89** εἴπερ need not, and probably does not, express doubt, while ἴσως in **91** qualifies ὅθεν and not the assertion that follows). The concluding words of **91**, 'all things are full of gods', occur also in Plato, in a probably conscious but unattributed quotation.[1] **90** cites the sophist and polymath Hippias as an earlier source than Aristotle for Thales' attribution of motive power to Magnesian (magnetic) stone, to which is added amber, which becomes magnetic when rubbed. Presumably the addition is from Hippias, who may well have been Aristotle's source here.[2]

[1] **92** Plato *Laws* 10, 899B ἔσθ' ὅστις ταῦτα ὁμολογῶν ὑπομενεῖ μὴ θεῶν εἶναι πλήρη πάντα; *(Is there anyone who will accept this and maintain that all things are* not *full of gods?)* The context deals with souls being called gods; it is quite in Plato's

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style to introduce, rather laboriously, a familiar phrase to enlighten an unfamiliar argument of his own, without naming the author. His use of the words in question is important, in any case, because it shows that they are not simply an Aristotelian summary. They could (in direct speech) be a genuine quotation from Thales; they have a totally different appearance from the banal apophthegms hopefully assigned to Thales in Demetrius of Phaleron's collection (*ap.* Stob. III, 1, 172, DK 10, 3). Aristotle repeated them, with the substitution of ψυχῆς for θεῶν and without attribution, at *Generation of Animals* Γ 11, 762a21.

[2] Snell, in *Philologus* 96 (1944), 170–82, showed that Hippias was quite possibly the source of Aristotle's other remarks on Thales, including the comparison with older ideas on Okeanos etc. (**11**, cf. **12**). The fragment of Hippias quoted by Clement, DK 86 B 6, shows that he made a collection of key passages on similar topics from Homer, Hesiod, Orphic writings, and Greek and other prose-sources. He was therefore the earliest systematic doxographer.

All that Aristotle seems to have known in **89** was that Thales thought that magnetic stone possesses soul because it is able to move iron; but the further inference, that for Thales the soul was something motive, is clearly legitimate. Soul, whether it was associated with breath, blood, or spinal fluid, was universally regarded as the source of consciousness and life. A man is alive, he can move his limbs and so move other things; if he faints, it means that his soul has withdrawn or become incapacitated; if he dies, it has become permanently so, and the 'soul' that goes squeaking down to Hades in Homer is a mere shadow, because it is dissociated from the body and can no longer produce life and movement. It is a common primitive tendency to regard rivers, trees and so on as somehow animated or inhabited by spirits: this is partly, though not wholly, because they seem to possess the faculty of self-movement and change, they differ from mere stocks and stones. Thales' attitude was not primitive, of course, but there is a connexion with that entirely unphilosophical animism. It should be noted, however, that his examples are of a different order; magnetic stone looks as unalive as could be, and cannot move or change itself, only a certain kind of external object. Thus Thales appears to have made explicit, in an extreme form, a way of thinking that permeated Greek mythology but whose ultimate origins were almost prearticulate. Now it is possible that our second piece of specific information, **91**, is a generalization based on this very conclusion that certain kinds of apparently inanimate object are alive, possess soul, because they have a limited power of movement. 'All things are full of gods':[1] the chief distinguishing marks of the gods are that they are immortal, they enjoy perpetual life, and that their power (their life-force, as it were) is unlimited, it extends both over the animate and over the inanimate world. Thus the assertion may well imply (since even apparently dead things like stone may

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possess soul of a kind) that the world as a whole manifests a power of change and motion which is certainly not even predominantly human, and must, both because of its permanence and because of its extent and variation, be regarded as divine, as due to the inherence of some form of immortal ψυχή.[2]

[1] Or of daimons, according to the paraphrase in Aetius after Theophrastus: **93** Aetius I, 7, 11 Θαλῆς νοῦν τοῦ κόσμου τὸν θεόν, τὸ δὲ πᾶν ἔμψυχον ἅμα καὶ δαιμόνων πλῆρες· διήκειν δὲ καὶ διὰ τοῦ στοιχειώδους ὑγροῦ δύναμιν θείαν κινητικὴν αὐτοῦ. *(Thales said that the mind of the world is god, and that the sum of things is besouled, and full of daimons; right through the elemental moisture there penetrates a divine power that moves it.)* The juxtaposition of the two statements from Aristotle is not significant. The last sentence is Stoic in form and content; the first clause (Θαλῆς...θεόν), too, is entirely anachronistic, and probably due to Stoic reinterpretation. It was repeated by Cicero, *de natura deorum* I, 10, 25, who added that god, as mind, made the world out of water. A considerable number of recognizably fictitious opinions, like this one, were attributed to Thales by puzzled or unscrupulous doxographers and biographers. Compare, perhaps, the 30,000 daimons of Hesiod *Works and Days* 252ff.

[2] The claim by Choerilus of Iasus (3rd–2nd cent. B.C.) and others, recorded in Diog. L. I, 24 (DK 11 A 1), that according to Thales the soul was immortal, obviously arose as an illegitimate conclusion from this kind of argument, and is again due to Stoic perversion (primarily) of the type of **93**. Thales could have distinguished clearly between the human ψυχή and the divine life-force in the world as a whole, at the same time as implicitly recognizing their underlying connexion.

The precise nature of Thales' belief that all things are full of gods is obviously not determinable. Even along the line of interpretation suggested above there is one notable uncertainty: did Thales make the bold induction, from the observation about Magnesian stone and amber, that *all* apparently inanimate things really possess soul to some degree? Or was Burnet right in maintaining (*EGP* 50) that 'to say the magnet and amber are alive is to imply, if anything, that other things are not'? In itself the fragmentary observation implies nothing either way. Nor does the assertion that all things are full of gods, even if it is closely connected with the observation about magnetic stone, necessarily imply that the universal induction was made; for just as one can say in English 'this book is full of absurdities' without meaning that every single thing in it is absurd, so πλήρης in Greek could mean 'containing a great number of', as well as 'absolutely filled out by'. *A priori*, it perhaps seems more probable that Thales meant that all things in sum (rather than each single thing) were interpenetrated by some kind of life-principle; although there would be many kinds of matter from which this life-principle, with its kinetic power, might be absent. The point was that the range of soul, or of

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life, was much greater than it appeared to be. Thales was giving an explicit and individual statement of a broad presupposition common to all the early physicists, that the world was somehow alive, that it underwent spontaneous change, and (what irritated Aristotle) that there was therefore no need to give any special account of natural change. This presupposition is still sometimes called 'hylozoism'; but this name implies too strongly that it is something uniform, determinable, and conscious. In fact the term applies to at least three possible and distinct attitudes of mind: (*a*) the assumption (conscious or not) that all things absolutely are in some way alive; (*b*) the belief that the world is interpenetrated by life, that many of its parts which appear inanimate are in fact animate; (*c*) the tendency to treat the world as a whole, whatever its detailed constitution, as a single living organism. (*a*) is an extreme, but in view of the universalizing tendency of Greek thought not an impossible, form of the general presupposition; in a way it might be said to be exemplified by Xenophanes. Thales' belief, it has been suggested, approaches close to (*b*). (*c*) is implicit in the old genealogical view of the world's history described in chapter I, which still persisted to some extent under the new rationalized form of philosophical cosmogony. Aristotle is seen at his most perspicuous in **116**, where, perhaps with Thales especially in mind, he shows himself aware of the possibility of this kind of attitude.[1]

[1] The spears in the *Iliad* (XI, 574 etc.) which are 'eager to devour flesh', and other similar cases, are sometimes cited as an indication that the animistic view was an old one. Animism is, of course, as old as man himself, and it arises out of the failure to objectify one's experience of the outside world, a technique which requires some practice. The Homeric expressions are better described as a literary conceit, like the pathetic fallacy – a deliberate rejection of the technique.

CONCLUSION

Thales was chiefly known for his prowess as a practical astronomer, geometer, and sage in general. His prediction of the eclipse was probably made feasible by his use of Babylonian records, perhaps obtained at Sardis; he also probably visited Egypt. His theory that the earth floats on water seems to have been derived from near-eastern cosmogonical myths, perhaps directly; water as the origin of things was also a part of these myths, but had been mentioned in a Greek context long before Thales. His development of this concept may in itself have seemed to Aristotle sufficient warrant for saying that Thales held water to be the ἀρχή, in its Peripatetic sense of a

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persisting substrate. Yet Thales could indeed have felt that since water is essential for the maintenance of plant and animal life – we do not know what meteorological arguments he used – it remains still as the basic constituent of things. Although these ideas were strongly affected, directly or indirectly, by mythological precedents, Thales evidently abandoned mythic formulations; this alone justifies the claim that he was the first philosopher, naïve though his thought still was. Further, he noticed that even certain kinds of stone could have a limited power of movement and therefore, he thought, of life-giving soul; the world as a whole, consequently, was somehow permeated (though probably not completely) by a life-force which might naturally, because of its extent and its persistence, be called divine. Whether he associated this life-force with water, the origin and perhaps the essential constituent of the world, we are not told.

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